

A NOTE ON MICROFILARIAE IN TANGANYIKA TERRITORY

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PREVIOUS OBSERVATIONS

Geographical distribution and incidence. Little appears to be known of endemic areas. Feldmann (1904), Marshall (1909) and Grothusen (1910) noted the prevalence of *Mf. perstans* in the district of Bukoba. It had been observed previously by Zupitsa, in 1897-98. Feldmann examined over 6,000 persons and found from 24 to 86 per cent. of the population, in various parts of the district, infected, the northern parts showing a greater incidence than the southern. In the south-east of the territory the district around Liwale appears also to be an endemic area as *Mf. perstans* was found by Mr. Irvine, sub-assistant surgeon, in 1924, in 31.5 per cent. of 402 adults examined. In regard to *Filaria bancrofti* even less is recorded. Elephantiasis was stated by Grothusen (1909), and previously by others, to be endemic in the Ubena-Ebene area, to the north-west of Lake Nyassa. Recent reports point to the prevalence of this disease in districts near the great lakes, as Mwanza and Bukoba in the north, and near Tukuyu (Neu Langenburg) in the south. In the region of the sea coast, there appear to be many cases of elephantiasis in Mafia Island, though no figures are yet available, while a considerable number are operated upon in the larger towns. Engeland (1920) found 32.32 per cent. of 297 native soldiers at Dar-es-Salaam infected with *Mf. bancrofti*. They, however, like the population of the coast towns, include people from many different parts.

Incidence in Dar-es-Salaam. In the years 1908-09 and 1909-10, microfilariae were found in slightly over 2 per cent. of nearly 40,000 thick blood films, examined chiefly for malaria and taken, no doubt, in the day-time. During the years 1922, 1923 and 1924, in the course of routine examination of a large number of thick blood films at the bacteriological laboratory at Dar-es-Salaam, microfilariae,

sheathed and unsheathed, grouped together, were found, as recorded in the annual reports, in 2.5 per cent., 2.2 per cent., and 3.6 per cent., respectively. The much greater incidence of *Mf. bancrofti* than of *Mf. perstans* in such examinations, was noted by Engeland and Manteufel (1911).

Species of microfilaria found. *Mf. bancrofti* and *Mf. perstans* only were found by Engeland and Manteufel. Fülleborn also (1908 and 1913a) found only these two species, with one possible exception, in blood slides received from Bukoba, Usumbura and Shirati, near the great lakes in the north, and from Dar-es-Salaam. The possible exception was a very small sheathed microfilaria, found by Manteufel (1911) in the blood of a soldier's boy in Dar-es-Salaam. The slide sent to Fülleborn, broken on the way, contained only about 10 microfilariae, stained with haemalum. Fülleborn admitted, with all reserve, that it might belong to a new species or be *Mf. powelli*, but that its possible identity with *Mf. bancrofti* could not be excluded. *Mf. loa* has not been found. Neave (1912) gives a list of flies found in German East Africa, which includes three species of Chrysops, viz., *C. bicolor* Cordier, *C. longicornis* Macq, and *C. magnifica* Austen. Limited reference only to subsequent literature has been available and this may not represent present knowledge. It is of interest that a considerable number of natives of West Africa were brought to this country during the late war.

Periodicity of Mf. bancrofti. That well-marked periodicity occurs in at least a great majority of cases was shown by Engeland. He found the microfilaria, as stated above, in 32.32 per cent. of soldiers, in the night blood, but in only 2.06 per cent. were they present also in the day time. Whether or not forms without periodicity also occur, as in the Southern Pacific and, perhaps, in West Africa, has not apparently been shown.

PRESENT OBSERVATIONS

From 300 to 400 thick blood films, chiefly of Africans, but including some Indians, taken at various unstated hours of the day, are examined monthly in ordinary routine work at the bacteriological laboratory at Dar-es-Salaam. In 768 such films, examined recently, microfilariae were found in 6.7 per cent. The latter figure refers to different individuals so the percentage given is a minimum.

Similar films were taken between 10 and 11 a.m., from 140 school pupils and from 140 prisoners. In the former, *Mf. bancrofti* was found in eight cases (5.7 per cent.) and *Mf. perstans* in one. In the latter *Mf. bancrofti* was present in seven cases (5 per cent.) and *Mf. perstans* in five. Examination in detail, including measurements with a camera lucida, was made in 30 cases, and observations as to periodicity in 21 cases. In a few cases only were living specimens examined and 'vital' staining with neutral red and azur II used. Staining with weak methylene blue, as described by Foley (1913) and by Sharp (1923) was not employed. Giemsa's stain and haemalum were chiefly used. The results confirm those of German observers. Microfilariae indistinguishable from *Mf. bancrofti* and *Mf. perstans* were the only kinds observed. Brief mention of a few details only is therefore made.

Mf. bancrofti. Morphology. The *sheath*, in nearly all the specimens, appeared to be unstriated. In one specimen the free anterior part of the sheath, in length about equal to one-fourth that of the worm, showed very clear, regular cross striation. If, as has been suggested by Fülleborn (1913b), it may be simply an impression of the striation of the body of the worm, in this case it was remarkably well-defined. Striation of the sheath has been observed by Brumpt (1922), who suggested that it might indicate a larval skin, and by Foley. It is referred to in a review of a paper by Biglieri (1923). The *anterior end* of the worm, in specimens stained with Giemsa's solution, showed various appearances, corresponding more or less with the descriptions of various authors. An interpretation of them could not confidently be made. Neither in living nor in stained specimens could a 'fang' or 'prepuce' be recognised. *Striation of the body*, in deeply-stained specimens, was observed to extend throughout the whole length of the worm, from the extremity of the anterior end to the tip of the tail. With ordinary staining it was not seen in front of the first nuclei. The *nuclei* were counted in a few specimens. The results did not agree with the figures given by Sharp. The number in front of the 'nerve ring,' for example, was from 60 to 70 or more. The appearances of the '*excretory cell*,' the '*central viscus*' or '*Innenkörper*' and the '*G¹ cell*' of Rodenwaldt agreed with Fülleborn's description and illustrations of *Mf. bancrofti*. The *tail* was not infrequently folded upon itself.

Measurements. 114 specimens from 26 cases. As the tip of the tail could not be seen clearly in many specimens, the *last tail nucleus* is assumed to be at 95 per cent. of the total length. The average position in 17 specimens measured was at 94.6 per cent.

The terms denoting the 'fixed points' of Fülleborn are used.

N.	Ex-P.	Ex-C.	G ¹ -C.	L. Tail-C.	Total length.
19	29	29.5	69.7	272.8	(287.1)

In over 83 per cent. of 114 specimens the 'nerve ring' was situated at a point between 18 per cent. and 20 per cent. of the length. The following are the figures of Fülleborn's measurements of 28 examples.

Microfilariae from German East Africa; ordinary thick dry preparations from 5 different slides; haemalum staining.

	N.	Ex-P.	G ¹ -C.	A-P.	L. Tail-C.	Total length
Average ...	19.9	30.1	70.3	82.6	95.3	263.7
Minimum ...	18.3	27	67	79?	94.4	245.5
Maximum ...	21.1	33	73.3	88.4?	96	291

Periodicity. Only persons in whose blood microfilariae were found in the daytime were examined. Measured quantities, viz., 20 c.mm. of blood were taken in 13 cases. In eight other cases, by the kindness of the staff of the native hospital, two thick films at midnight and two by day were taken on two or three successive days. The day time was usually 9 a.m. In no case was the number of microfilariae in the day blood equal to that in the night and in nearly all cases the disproportion was greater than could be accounted for by ordinary fluctuations, at the same hour on successive occasions, of, say, 300 per cent. Fluctuations are known to be considerable. In one case, for example, the number in 20 c.mm. of blood taken at the same hour of the night on several occasions, varied between 235 and 604. This case showed 17 at 5 p.m. and one only at noon, on two occasions. The greatest number found in daytime blood was 62, in 20 c.mm. of blood at 9 a.m. In this case, at 11 p.m., the number was 211. One case showed seven at noon and 13 at 11 p.m. So far as any conclusion can be drawn from these few observations, it would appear that a form of *Mf. bancrofti* without periodicity, if existing at all in this country, must be rare.

Mf. perstans. Citrated blood was centrifuged and dehaemoglobinised, for examination, especially of the anterior end.

In living specimens a small spot, usually terminal, occasionally apparently lateral, was seen. 'Vital staining' with neutral red showed a small conical structure, base to the front, just behind the outline of the anterior end. In some specimens the anterior margin appeared to show minute papillae. No constant feature, however, could be seen in the examination of about 20 specimens. No 'fang' was seen.

Stained specimens. These showed the morphological characters of *Mf. perstans*. The nuclear 'break' at 84 per cent. was a fairly constant character. Deep staining failed to show more than very slightly-marked cross striation.

Measurements. 47 specimens were measured. There is some lack of uniformity in measurements given by different authors even in the position of such a constant and sharply-defined feature as the 'nerve ring.' The following examples are given for comparison.

Brumpt (1922). Fülleborn's terms are used.

N.	Ex-P.	A-P.
26.4	... 36	... 83

These figures are quoted by Stephens and Yorke (1921).

Rousseau (1919).

N.	Ex-P.	G ¹ -C.	A-P.
25	... 32	... 62.6	... 83.5

Macfie and Corson (1922).

N.	Ex-P.	G ¹ -C.	A-P.
22.5	... 32.7	... 62.3	... 81.1

In the present cases the average figures were as follows :—

N.	Ex-P.	A-P.	Total length.
22.8	... 31.9	... 84.2	... 189.2

In over 90 per cent. of the specimens the position of the 'nerve ring' was between 20 per cent. and 24 per cent. of the length.

The small form of *Mf. perstans* was not observed.

SUMMARY

1. Little is known of endemic areas of filarial infection in Tanganyika Territory. In addition to districts near the great lakes in the north-west, *A. perstans* is probably endemic in the south-east, around Liwale.

2. *Mf. bancrofti* and *Mf. perstans* are the only forms known to occur.

3. *Mf. bancrofti* was found to have a well-marked periodicity in all cases in which sufficient numbers were present, though occurring, in a small proportion of cases, in the blood in the daytime.

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